

GP-304183

## FUEL CELL SHUTDOWN AND STARTUP USING A CATHODE RECYCLE LOOP

### ABSTRACT OF THE DISCLOSURE

A method and device for operating a fuel cell system. A recirculation loop coupled to a fuel cell cathode ensures that fluids passing through the cathode are recycled, thereby enabling reaction between residual oxygen in the recycled fluid and fuel that has been introduced into the recirculation loop until a reduced voltage level across the fuel cell is achieved. Attainment of the reduced voltage level indicates that the recycled fluid is substantially oxygen-free, yielding an inerting fluid. Thereafter, this compound, followed by air, or air directly can be used to purge the fuel cell's anode and related flowpath during system shutdown. Similarly during system startup, hydrogen can then be introduced into the fuel cell's anode and then air into the cathode and related flowpath for normal operation. The placement of a purge valve allows the anode to be purged with air without re-introducing air into the cathode.